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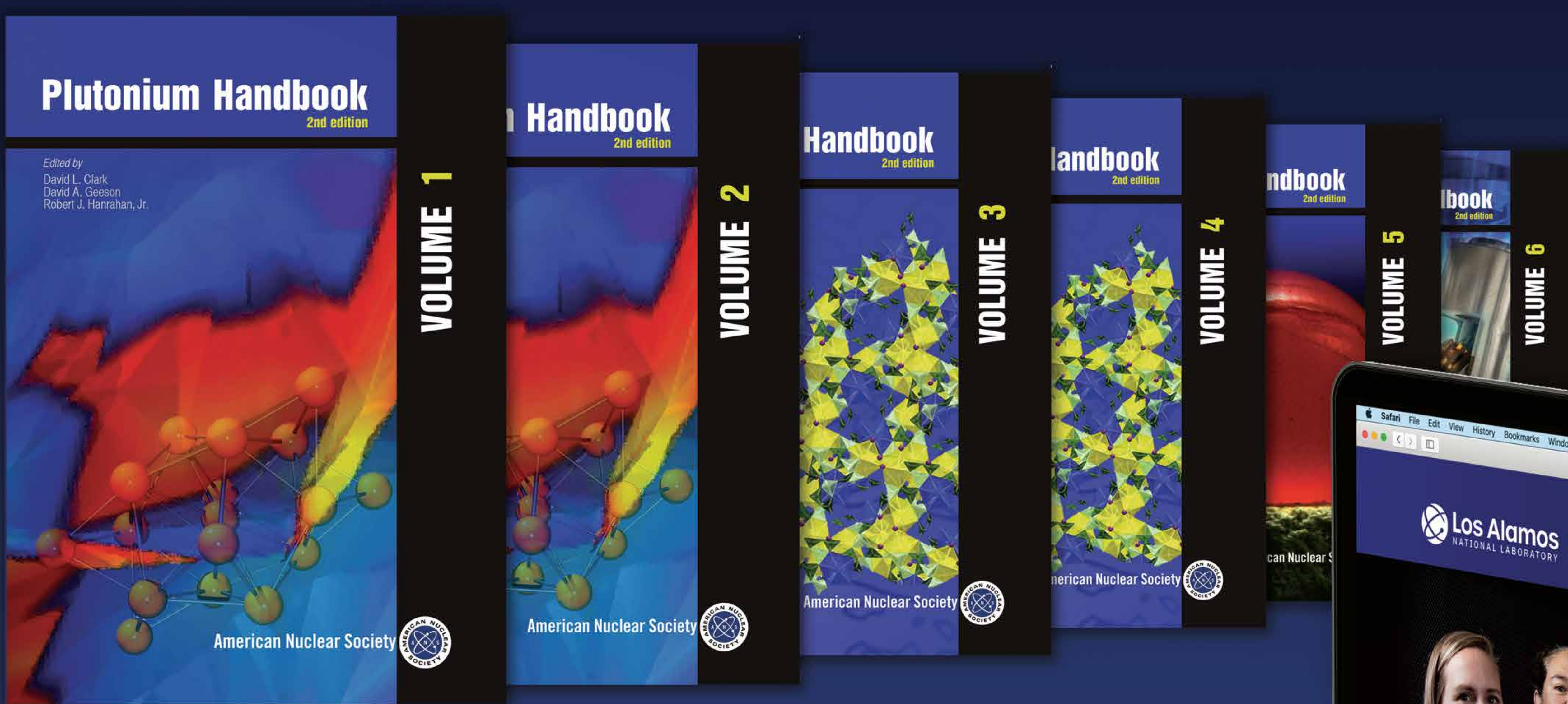

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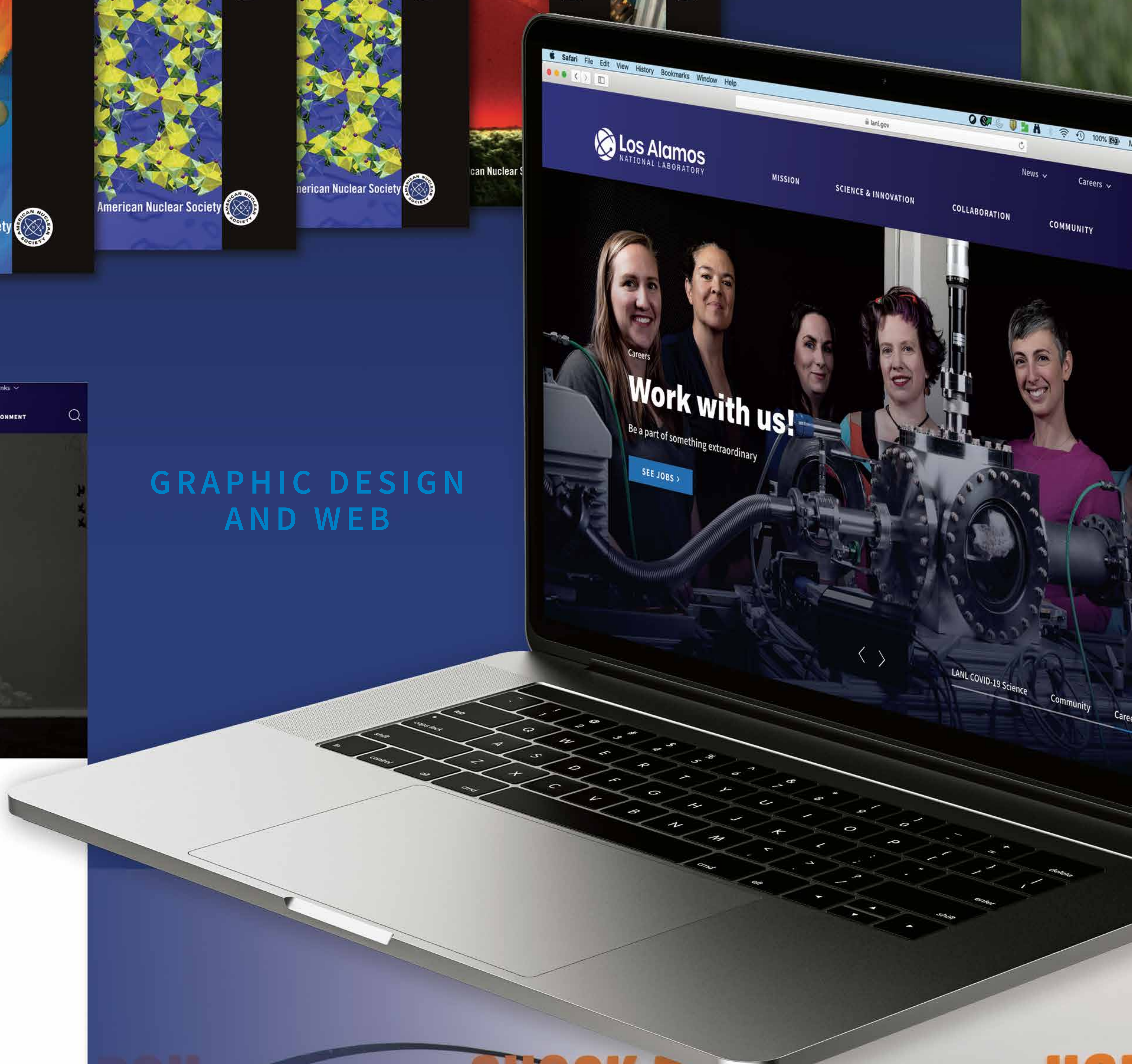

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The Trinity test

BY VIRGINIA GRANT | JULY 13, 2020

NATIONAL ★ SECURITY SCIENCE

ALL NEWS / PUBLICATIONS / NATIONAL SECURITY SCIENCE / SUMMER 2020 / THE TRINITY TEST

Whitney Spivey
Editor

SHARE

Seventy-five years ago, Los Alamos scientists detonated the Gadget—the world's first atomic bomb.

On July 16, 1945, a predawn thunderstorm moved through the desert near Alamogordo, New Mexico, about 120 miles south of Albuquerque. After it passed, at 5:29:45 a.m., detonators ignited explosives around a large, steel, globe-shaped device on a 100-foot tower. The explosion prompted a fission chain reaction in the plutonium inside the globe. The resulting nuclear blast from the Gadget, as the device was called, released an explosive force of 21 kilotons (equivalent to 21 thousands tons of TNT), more than had been predicted. It created a blinding flash of light, a thunderous sound, and a mushroom cloud 38,000 feet tall. "Some people claim to have wondered at the time about the future of mankind," remembered physicist Norris Bradbury of witnessing the event. "I didn't. We were at war, and the damned thing worked." This was the Trinity test, the culmination of 27 months of work at Project Y—a secret laboratory in Los Alamos—to create the world's first atomic bomb.

The necessity of testing

Project Y covertly developed two types of nuclear weapons. The first type—exemplified by Little Boy, the bomb eventually dropped over Hiroshima, Japan—achieved detonation by firing a subcritical piece of uranium at another subcritical piece of uranium, thus starting a supercritical reaction. Scientists were so certain that this gun-type design would work that full-scale testing was deemed unnecessary.

The Gadget and Fat Man (the bomb dropped over Nagasaki) were of a different type; they were implosion bombs, with cores of subcritical plutonium that reached a supercritical mass because of pressure from the explosives surrounding them. Scientists weren't quite as confident in this design and felt the need to test the technology before its use in war.

In preparation for the Trinity test, an experiment using ordinary high explosives took place on May 7, 1945. The experiment, which detonated more than 100 tons of TNT stacked on a tower, allowed scientists to practice timing and calibrate instruments that would detect energy release, thermal radiation, and other factors. Los Alamos National Laboratory

"The set of problems connected with implosion was the most difficult," said Laboratory Director Robert Oppenheimer of the development of the Gadget. "It required very new experimental techniques, and it was not a branch of physics which anyone was very familiar with."

Preparing to (hopefully) make history

The Trinity test, directed by physicist Kenneth Bainbridge, would take place at the U.S. Air Force's Alamogordo Bombing and Gunnery Range in the Jornada del Muerto ("Journey of Death") desert of New Mexico. The site, which was selected in September 1944, provided isolation and also proximity to Los Alamos, which was about 210 miles away. The area was flat, with little wind, providing better conditions for studying the explosion and its aftermath.

Trinity Tower

A great deal of construction commenced that fall. A base camp was built for the approximately 250 people who worked on preparations, roads were paved for the transport of materials to the site, and electricity was run to the test tower for the detonators. Three shelters—one each at 10,000 yards north, west, and south of ground zero—were constructed to protect people (scientists and soldiers) and equipment (for observation and radiation detection) during the test. More than 52 cameras were used to photograph and video record the test, including special high-speed cameras developed by members of the Weapons Physics Division for the purpose of recording nuclear explosions.

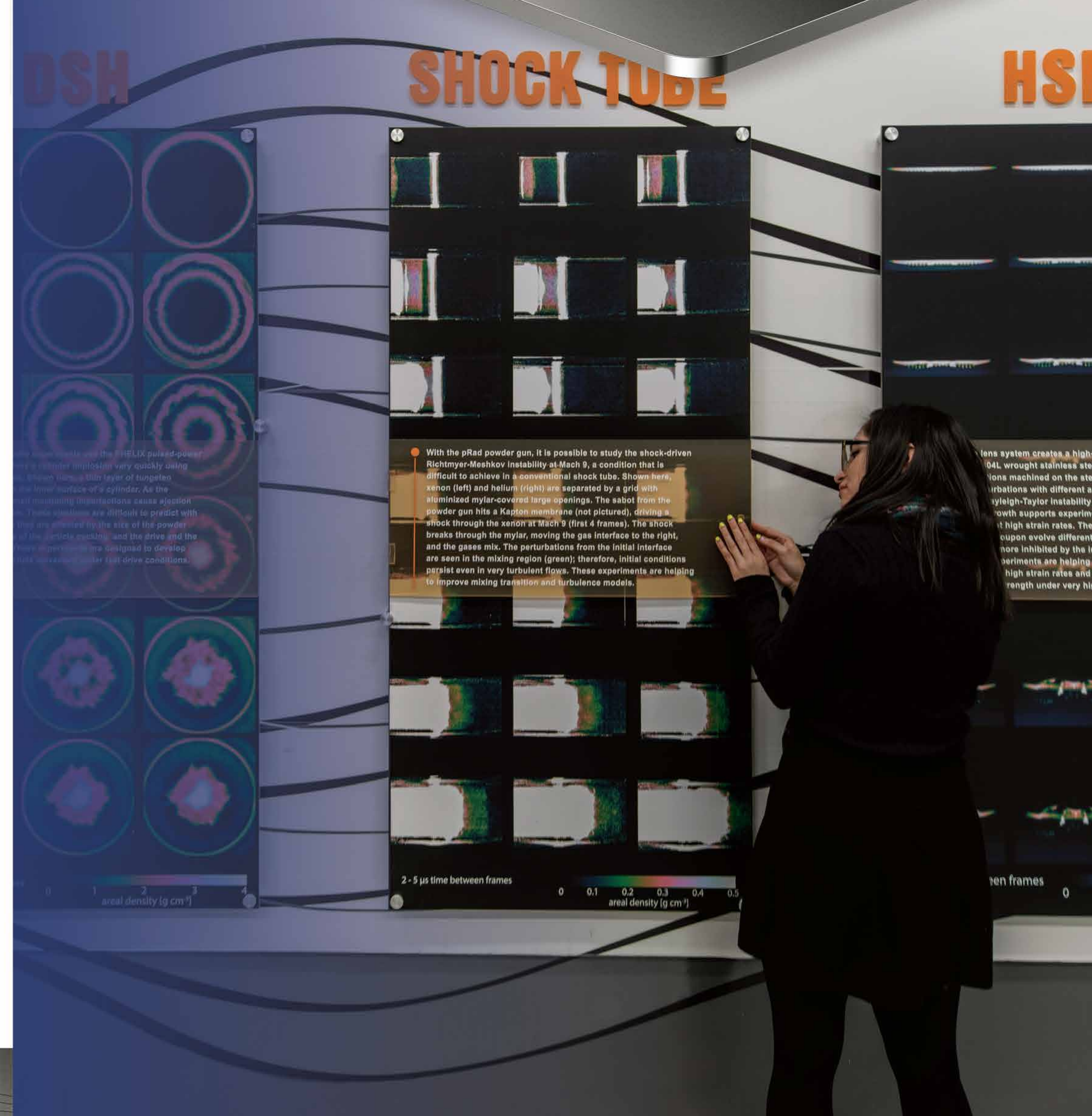
Gadget Mounted on Tower

Gadget mounted on tower.

To prevent the waste of the plutonium in the Gadget's core, scientists considered building a giant concrete bowl filled with water to catch plutonium. This idea never materialized at the Trinity site, although a smaller version was built at Los Alamos. Scientists also contemplated detonating the Gadget inside Jumbo, a 216-ton steel cylinder that would contain plutonium if the detonation failed. Jumbo was built but never used. A quarter mile from ground zero, the vessel was unharmed by the blast. After World War II, eight 500-pound bombs were exploded inside Jumbo, but much of the cylinder stayed intact and remains today at the Trinity site.

Another important construction project was the 100-foot steel tower atop which the Gadget was detonated. The tower was used to get good images of the early fireball expanding and to reduce fallout—the radioactive dust and ash created when a nuclear weapon explodes. (Ultimately the tower was too short for a 21-kiloton test, and the blast produced a lot of fallout.)

The Gadget was hauled up the tower by an electric winch. During the process, part of the device became unhinged. For just this circumstance, a truckload of mattresses had been brought in and placed around the tower. Despite some onlooker panic, the Gadget was stabilized before it could fall.



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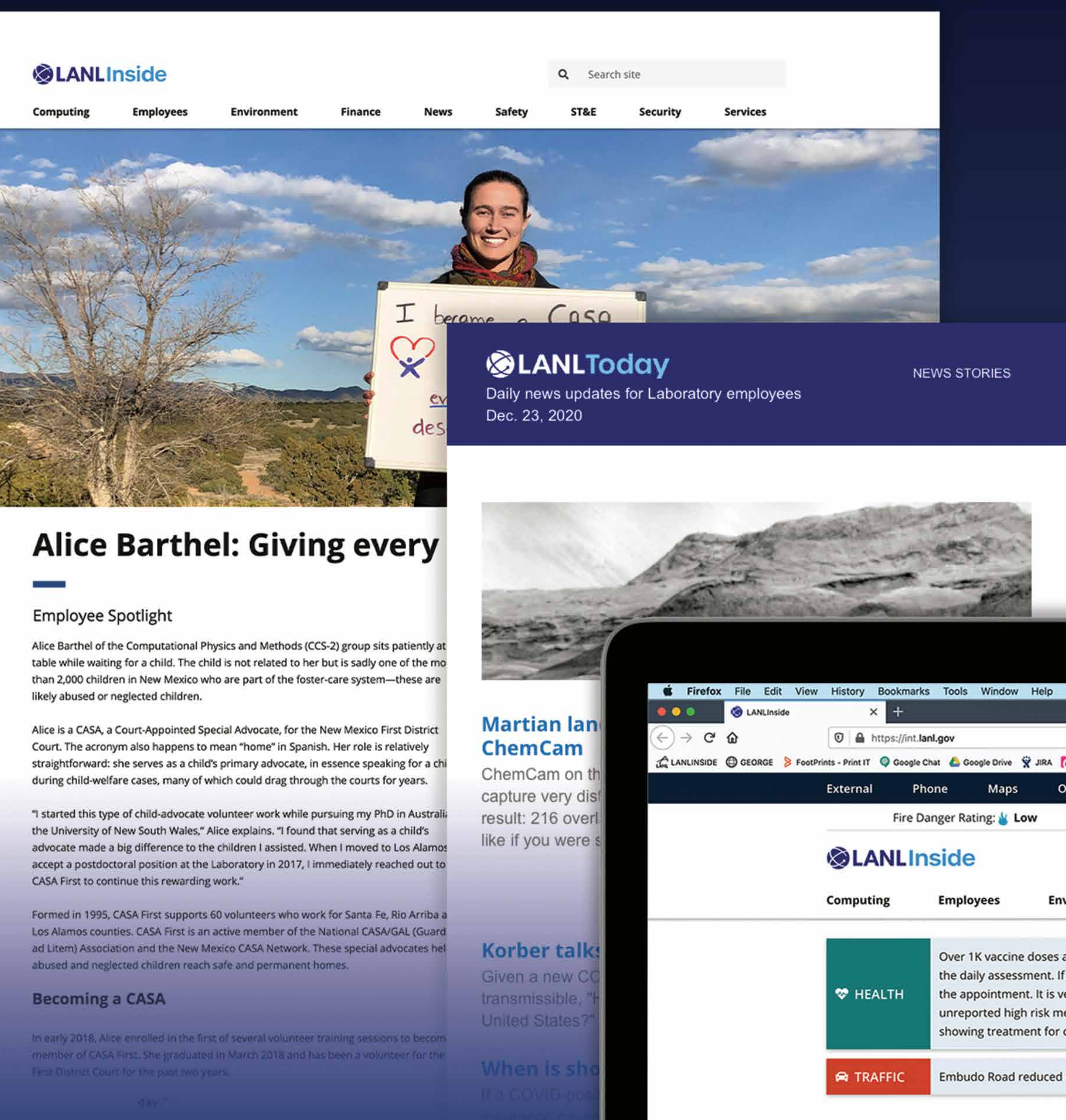

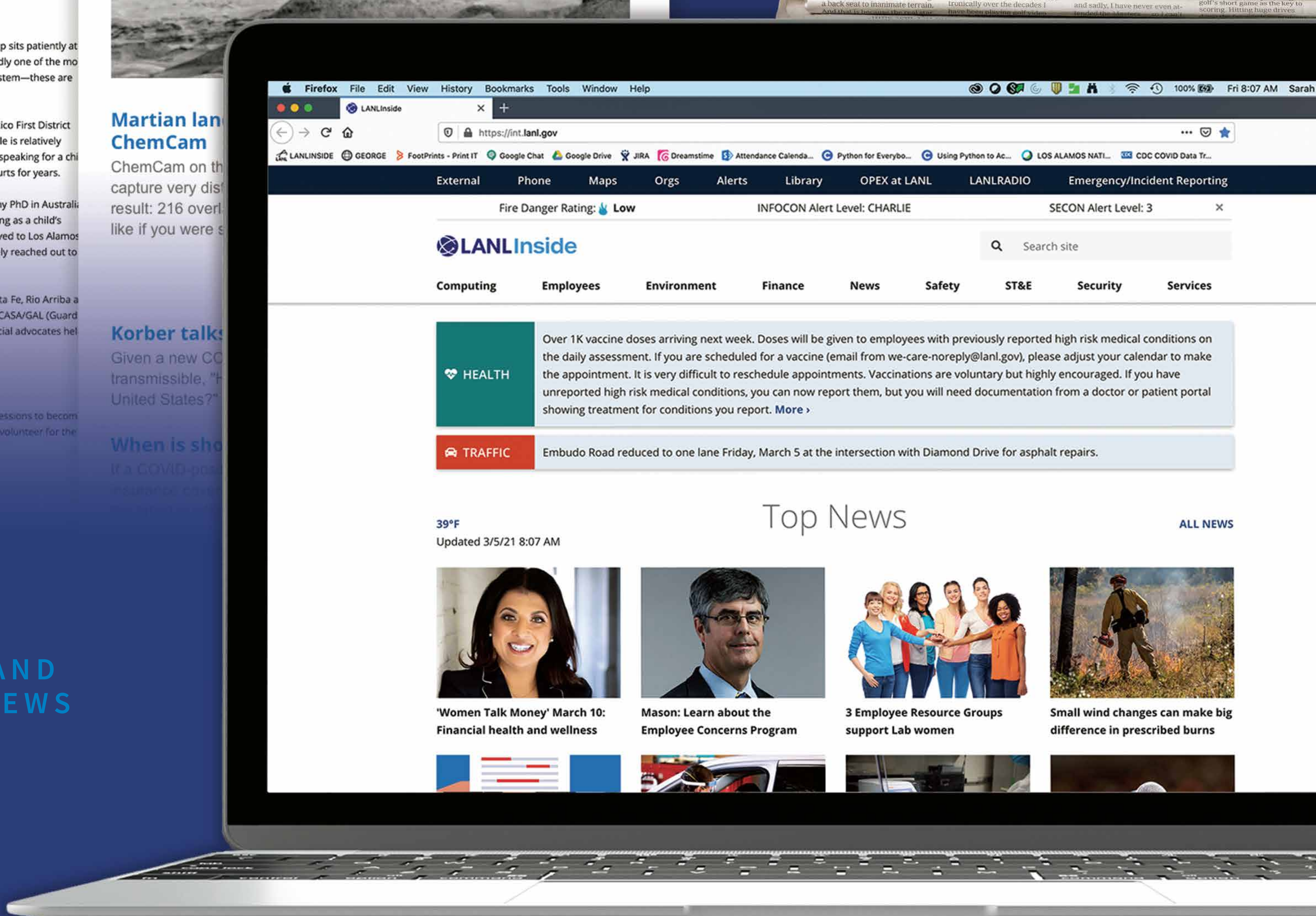

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